

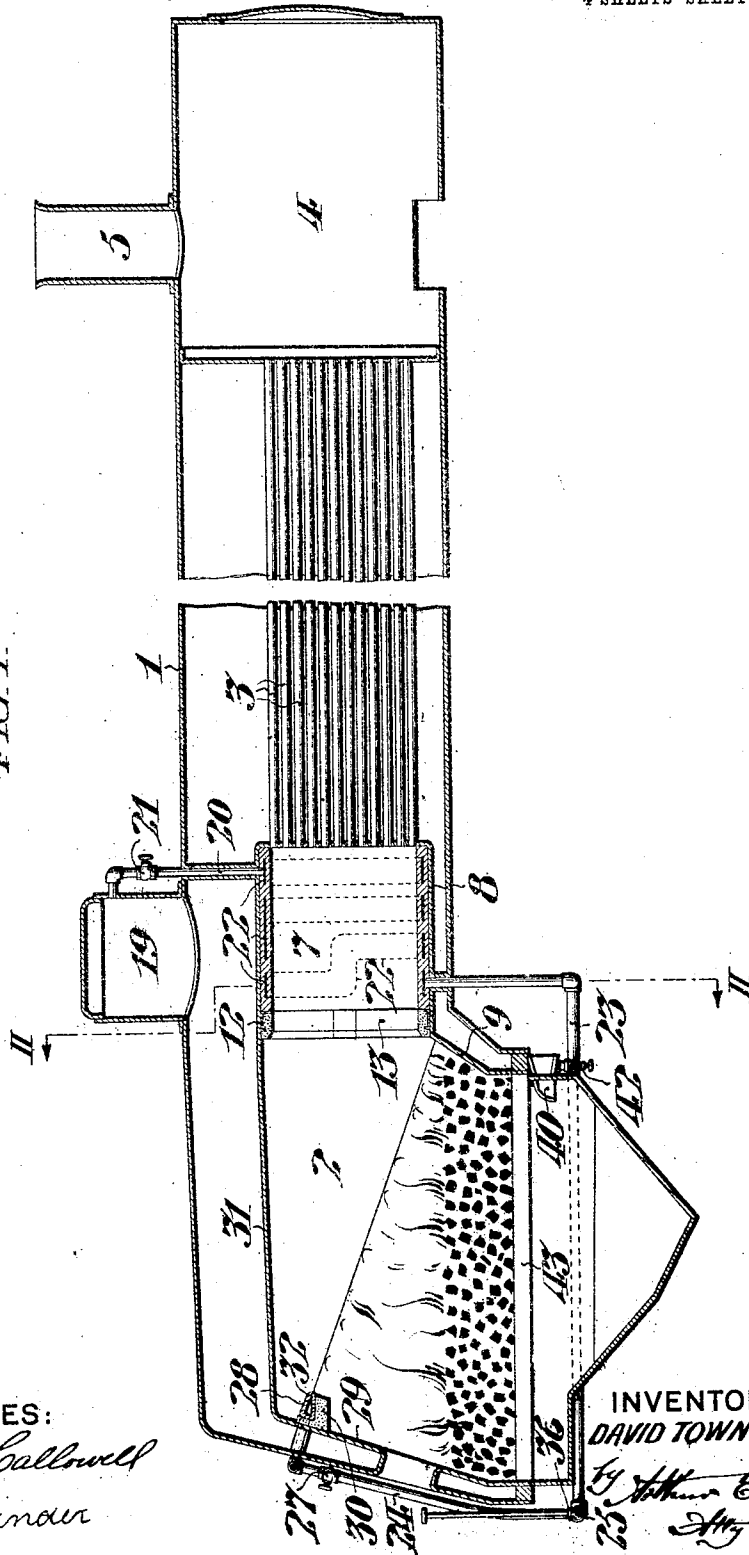
D. TOWNSEND.
SMOKE CONSUMING DEVICE.
APPLICATION FILED APR. 12, 1909.

1,044,297.

Patented Nov. 12, 1912.

4 SHEETS—SHEET 1.

FIG. 1.



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4 SHEETS—SHEET 2.

FIG. II.

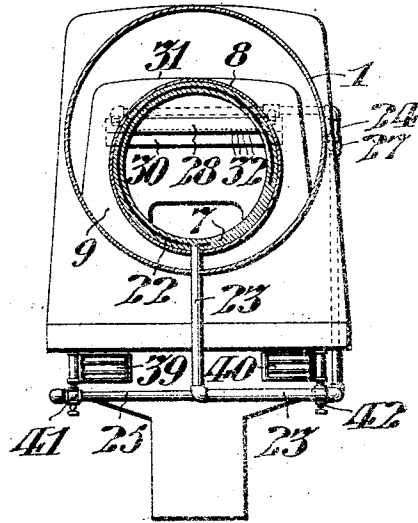


FIG. III.

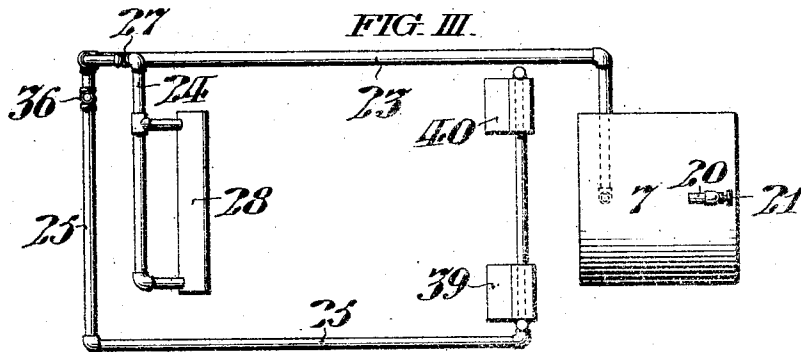
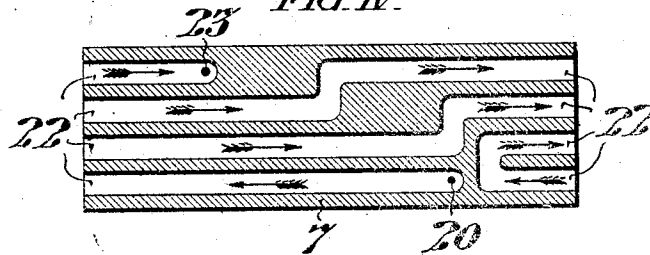


FIG. IV.



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4 SHEETS—SHEET 3.

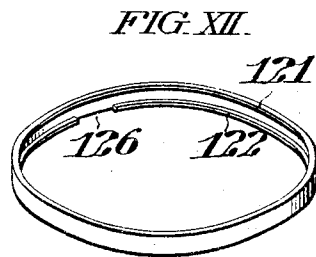
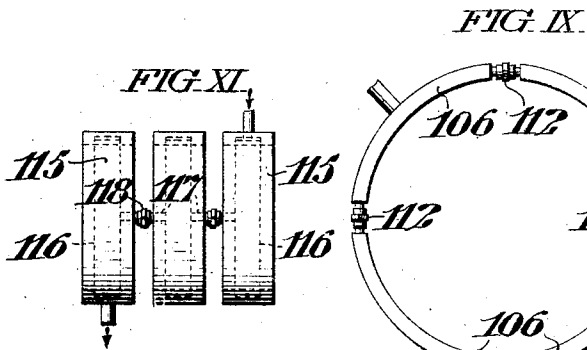
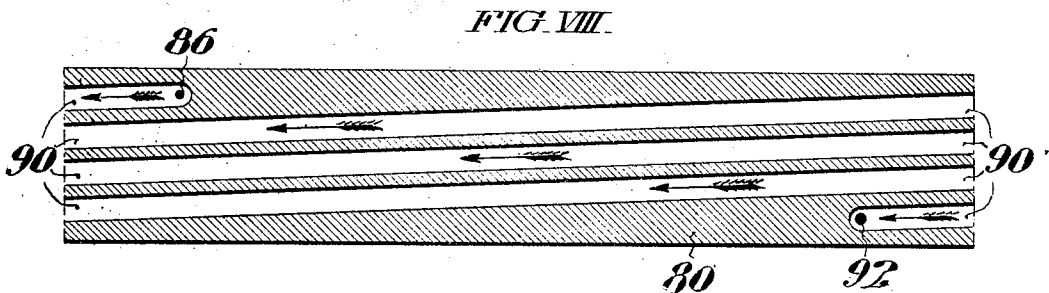
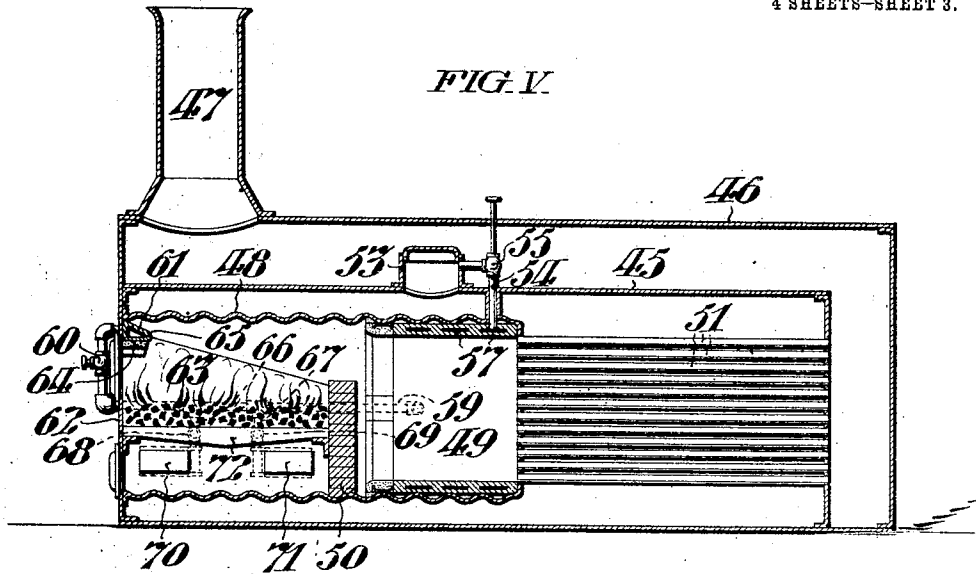


FIG. XI.

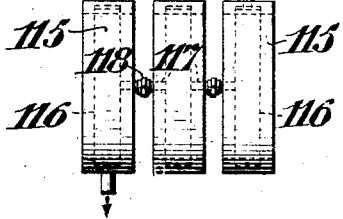


FIG. X.

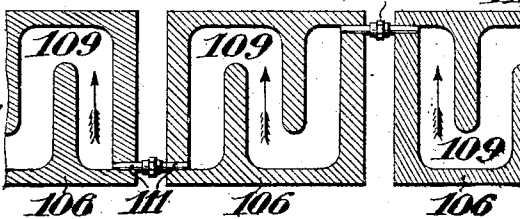


FIG. XIII. FIG. XIV.



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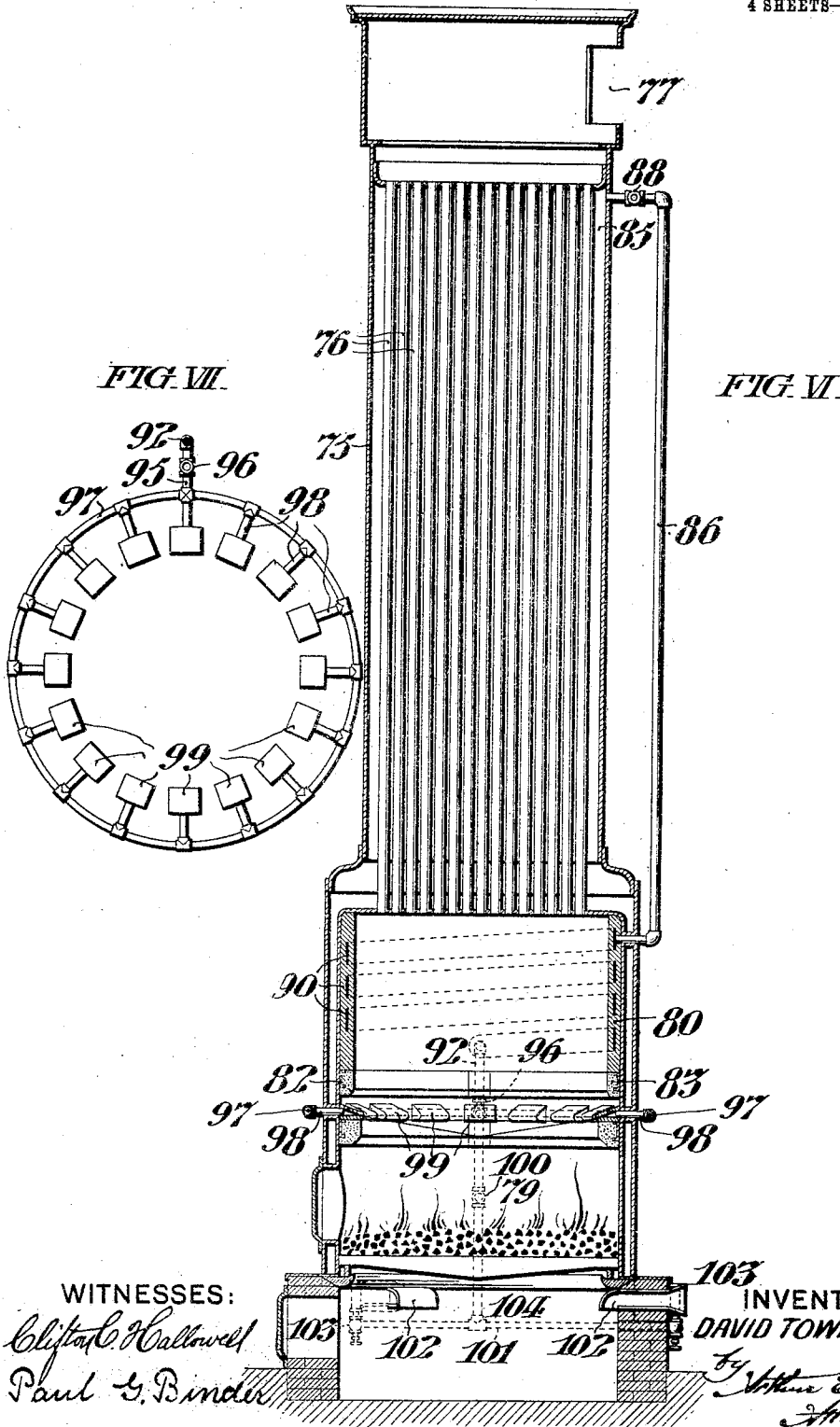
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4 SHEETS—SHEET 4.



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UNITED STATES PATENT OFFICE.

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SMOKE-CONSUMING DEVICE.

1,044,297.

Specification of Letters Patent.

Patented Nov. 12, 1912.

Application filed April 12, 1909. Serial No. 489,389.

To all whom it may concern:

Be it known that I, DAVID TOWNSEND, a citizen of the United States, and resident of Philadelphia, in the State of Pennsylvania, have invented a certain new and useful Improvement in Smoke-Consuming Devices, whereof the following is a specification, reference being had to the accompanying drawings.

My invention relates to boilers and comprises means whereby the steam generated therein is superheated in a retort adjacent to the boiler furnace, and injected below the coal fire in the furnace, with the air supplied to the latter, and directed in a sheet coextensive with the furnace chamber above said fire, whereby the smoke arising from said fire is forcibly mixed and consumed with the injected fluid.

The form of my invention hereinafter described is embodied in an internally fired boiler, and includes an annular retort interposed between the boiler furnace and the boiler tubes, out of contact with the fuel, and so arranged that the steam traversing a passageway in the walls of said retort is superheated by the gases of combustion in contact with said walls and being directed by said retort to the boiler tubes.

My invention comprises the various novel features of construction and arrangement hereinafter more definitely specified.

In the accompanying drawings; Figure I is a central vertical longitudinal sectional view of a locomotive boiler conveniently embodying my invention. Fig. II is a transverse vertical sectional view of said boiler taken on the line II, II, Fig. I. Fig. III is a plan view showing the relative position and connections of the retort, injectors and nozzles indicated in Figs. I and II. Fig. IV is a sectional plane development taken through the passageway of the retort shown in Fig. I. Fig. V is a vertical longitudinal sectional view of a marine type of boiler conveniently embodying my invention. Fig. VI is a central vertical sectional view of an upright boiler of the stationary type conveniently embodying my invention. Fig. VII is a plan view showing the relative position of the nozzles and their connections shown in the Fig. VI. Fig. VIII is a sectional plane development taken through the passageway of the retort shown

in Fig. VI. Fig. IX is a plan view of a modified form of retort formed by a plurality of partial cylindrical sections. Fig. X is a fragmentary sectional plane development of the form of retort shown on Fig. IX. Fig. XI is another modified form of retort formed by a series of annular sections. Fig. XII is a perspective view of the channel-ring arranged to retain the retort. Figs. XIII and XIV are sections of fire-brick arranged to be held by the channel-ring.

In the form of my invention shown in Figs. I to IV inclusive; the boiler 1 is provided with the furnace 2, connected by the tubes 3, with the smoke chamber 4, which has the outlet stack 5.

The retort 7, which is arranged to superheat steam from the boiler 1, is supported in the cylindrical extension 8, projecting forwardly from the fire-box 9 in concentric relation with the group of tubes 3, and is conveniently secured by the channel-ring 12, which also serves to retain the fire-brick 13 abutted against the edge of said retort. Said retort 7 is connected with the steam dome 19 by the pipe 20, controlled by the valve 21, and has the tortuous passageway 22 arranged to direct steam from the pipe 20 through the pipe 23 and its branches 24 and 25.

It is to be noted that the passageway 22 is so formed as to insure the maximum exposure to the heat of the furnace, of the steam which is progressed therethrough in a thin film, and which is thus superheated.

As shown in Fig. III, the fluid in the retort 7 is directed by the branch pipe 24 under control of the valve 27 to the nozzles 28, which as indicated in Fig. I, extend transversely in the furnace chamber 2 along the rear wall 29 thereof. Said nozzles 28 being protected from the heat by the angular shelf 30 of refractory material, and supported adjacent to the crown sheet 31, have a horizontal series of jet orifices 32 arranged to direct the fluid in a common plane extending forwardly to the front of the fire-box between the top of the fuel, and the bottom of the retort 7. Said shelf 30 is conveniently supported by the pipes which lead to said nozzles 28, and which extend through apertures in said shelf. The branch pipe 25 which is controlled by the valve 36

directs said fluid from the pipe 23 to the injectors 39 and 40 respectively controlled by the valves 41 and 42, and arranged to inject the fluid below the grate 43.

Fig. V shows a convenient form of my invention as applied to an internally fired marine boiler; wherein the boiler 45 inclosed by the casing 46, is provided with the outlet stack 47, and its corrugated fire-box 48 extends within said boiler and supports the retort 49 between the furnace bridge wall 50, and the tubes 51. Said retort 49 is connected with the steam dome 53 by the pipe 54 controlled by the valve 55, and has the tortuous passageway 57 arranged to receive steam from the pipe 54 and direct fluid through the pipe 59 controlled by the valve 60, to the nozzles 61. Said nozzles 61 are supported transversely along the rear wall 62 of the furnace 63, upon a shelf 64 of refractory material, and have a horizontal series of jet orifices 65 arranged to direct the fluid in a common plane extending to the bridge wall 50 slightly above the top of the fuel. Said pipe 59 is provided with branches 66 and 67 respectively controlled by the valves 68 and 69 leading to the injectors 70 and 71, which are arranged to inject the fluid below the grate 72 of said furnace 63.

In the form of my invention shown in Fig. VI; the vertical boiler 75 having the tubes 76 and smoke outlet 77, is provided with the furnace 79 whose walls inclose the retort 80, which is supported therein by the channel ring 82, carrying the fire-brick 83, arranged to protect the edge of said retort.

The retort 80 is connected with the steam chamber 85 by the pipe 86 controlled by the valve 88, and has the spiral passageway 90 best shown developed in a plane in Fig. VIII, arranged to receive steam from the boiler and direct the fluid through the pipe 92 and its branch 95, controlled by the valve 96, to the pipe 97 and its branches 98 leading to the nozzles 99, which direct the fluid in planes which together form a substantially conical sheet above the fire. Said pipe 92, is controlled by the valve 100, and is connected with the pipe 101, which is connected with the injectors 102, independently controlled by the valves 103, and arranged to inject fluid below the grate 104.

Figs. IX and X show a modified form of retort which may be more readily removed and replaced than those above described, being formed of separable curved sections 106, each having a tortuous passageway 109 oppositely terminating in pipe nipples 111, connected by the unions 112. The space between said sections 106 may be conveniently filled with fire-brick, clay or other refractory material.

Fig. XI shows another modified form of retort consisting of a plurality of annular

sections 115, each having a passageway 116; said passageways being connected by the pipes 117, and unions 118.

The channel-rings above described have the flanges 121 and 122, as best shown in Fig. XII, the latter being arranged to engage the grooves 123 in the fire brick sections 124 and 125 to support said sections, and having the recess 126, whereby the fire-brick section 125 may be inserted in an axial direction between the opposite ends of the series of sections 124. All the sections being then shifted in a rotary direction relative to said channel-ring until a section 124 spans said recess and the series of said sections form the continuous fire-brick ring which is readily supported upon said flange 122, and prevented from accidental displacement.

I do not desire to limit myself to the precise details of construction and arrangement herein set forth, as it is obvious that various modifications may be made therein without departing from the essential features of my invention as defined in the appended claims.

I claim:—

1. The combination with a boiler having a furnace, and tubes arranged to convey the products of combustion from said furnace; of an annular retort mounted between said furnace and said tubes, and forming a conduit arranged to direct the products of combustion from said furnace to said tubes, and having a passageway through its walls for the passage of steam to be superheated; means directing steam from said boiler into said passageway where it is superheated, by the heat from the furnace, passing through the said retort; and, means directing the superheated fluid into the furnace chamber whereby it is mixed with the products of combustion of the coal in said chamber.

2. The combination with a boiler having tubes arranged to convey the gases of combustion, and a furnace having an extension connected with said tubes; of a metallic retort mounted in said extension, and forming a conduit arranged to direct the gases of combustion from the furnace chamber to said tubes, and having a shallow passageway extending through its walls, and arranged to direct steam from said boiler around the gases of combustion; means arranged to direct the fluid thus produced, into the furnace chamber; means comprising a channel-ring arranged to retain said retort in said extension; and, means whereby a ring of fire-brick may be removably supported by said channel-ring, to protect the edge of said retort.

3. The combination with a boiler having tubes arranged to convey the gases of combustion; and a furnace having an extension connected with said tubes; of a metallic annular retort mounted in said extension, and

forming a conduit arranged to direct the gases of combustion from the furnace chamber to said tubes, and having a shallow spiral passageway extending within its walls, and
 5 arranged to direct steam from said boiler around the gases of combustion; a circular series of nozzles each having a horizontal series of jet orifices arranged to direct fluid from said retort in plane sheets above the
 10 fire, and thereby form a conical sheet of fluid to mix with the gases of combustion and burn with the carbon particles carried thereby; means supporting said retort; and, means supporting said nozzles.

15 4. The combination with a boiler having tubes, and a furnace having an extension providing a tube sheet connected with said tubes; of an annular metallic retort, having a shallow passageway, supported within said
 20 extension, and forming a conduit through which the gases of combustion are directed from said furnace to said tubes; means arranged to direct steam from the boiler to the passageway in said retort; a channel-ring
 25 arranged to retain said retort in said extension, and having a recess in its flange; and, a fire-brick ring formed in sections having grooves arranged to be engaged by the
 30 flanges of said channel-ring, one of said sections being relatively short and arranged to be inserted in said recess between the opposite ends of a series of bricks which may be
 35 shifted in a rotary direction with respect to said channel-ring, to such an extent that said recess is spanned by one of the relatively
 long fire-bricks, said series of bricks forming a continuous removable integral fire-brick ring retained by said flange.

5. The combination with a furnace, and a
 40 boiler having tubes arranged to convey the gases of combustion from said furnace; of an annular retort mounted between said furnace and said tubes, and arranged to direct the gases of combustion to said tubes, and
 45 having a shallow passageway extending through the walls of said retort, arranged to direct steam around the gases of combustion

to be superheated; nozzles in said furnace each having a horizontal series of jet orifices; means arranged to direct steam
 50 from said boiler into the passageway in said retort; a channel-ring, carrying an annular fire-brick arranged to support said nozzles and protect them from the extreme heat of
 55 said furnace, said channel-ring having a recess in one of its flanges, and said fire-brick being composed of a series of sections having one relatively short section, the latter
 being arranged to be inserted in said recess, between the opposite ends of the series of
 60 fire-brick sections, and so arranged that said fire-brick sections may be shifted relative to said channel-ring to present one of the relatively long sections in position to span said
 65 recess and prevent the accidental displacement of said sections.

6. The combination with a boiler having tubes arranged to convey the gases of combustion, and a furnace having an extension
 70 connected with said tubes; of a metallic retort mounted in said extension and forming a conduit arranged to direct the gases of combustion from the furnace chamber to
 said tubes, and having a shallow spiral passageway extending through its walls, and
 75 arranged to direct steam from said boiler around the gases of combustion; means arranged to direct steam from said boiler into said passageway; nozzles in said furnace
 chamber each having a horizontal series of
 80 jet orifices; means connecting said retort with said nozzles; a channel-ring arranged to support said retort in said extension, and carrying fire-brick arranged to protect the
 edge of said retort from the extreme heat
 85 of the furnace; and, a channel-ring carrying fire-brick arranged to support said burners.

In testimony whereof, I have hereunto signed my name at Philadelphia, Pa., this eighth day of April, 1909.

DAVID TOWNSEND.

Witnesses:

CHAS. Z. WOLFF,
 OLIVE M. BOEHM.